

CLAIMS

What is claimed:

1. ~~A~~ method of treating an electroless plating waste, comprising:
 - containing the waste in a container, the waste including a metal and a reducing agent;
 - decreasing an ability for the reducing agent to reduce the metal, resulting in a release of a gas from the waste in the container at a rate which is higher than without the decrease in the ability for the reducing agent to reduce the metal, the gas being contained in an enclosed volume;
 - exhausting the gas from the enclosed volume; and
 - draining the waste from the container.
2. The method of claim 1 wherein the ability for the reducing agent to reduce the metal is decreased by at least one of:
 - (i) adding a stabilizing chemical to the waste which decreases a pH of the waste;
 - (ii) adding a stabilizing chemical to the waste which changes a potential of the reducing agent from anodic toward cathodic;
 - (iii) adding a stabilizing chemical to the waste which causes precipitation of the metal out of the waste; and

(iv) applying a positive voltage to an anode to which the waste is exposed to oxidize the reducing agent.

3. The method of claim 1 wherein the ability for the reducing agent to reduce the metal is decreased by adding a stabilizing chemical to the waste which decreases a pH of the waste.

4. The method of claim 3 wherein the pH decreases by at least 5.

5. The method of claim 3, further comprising:
detecting a pH of the waste, the waste being drained after the pH falls below a predetermined limit.

6. The method of claim 3 wherein the pH is reduced by decomposing the reducing agent by at least one of:

- (i) an oxidation reaction, and
- (ii) a hydrolysis reaction.

7. The method of claim 1 wherein the metal is cobalt, the reducing agent is at least one of DMAB, hypophosphite, formaldehyde, and borohydride, and the ability for the reducing agent to reduce the metal is reduced by decomposing the

reducing agent, utilizing at least one of a hydrolysis reaction and an oxidation reaction.

8. The method of claim 1 wherein the metal is copper, the reducing agent is at least one of glyoxylic acid and formaldehyde, and the ability for the reducing agent to reduce the metal is decreased by oxidizing the reducing agent.

9. The method of claim 8, further comprising:
adding palladium to the waste and increasing the temperature to at least 40° C; and

detecting a concentration of the gas in the enclosed volume, the waste being drained after the concentration falls below a predetermined limit.

10. The method of claim 1 wherein the ability for the reducing agent to reduce the metal is decreased by adding a stabilizing chemical to the waste, which changes a potential of the reducing agent from anodic toward cathodic.

11. The method of claim 1 wherein the metal is copper, the reducing agent is at least one of formaldehyde and glyoxylic acid, and the stabilizing chemical is an acid.

12. The method of claim 1 wherein the ability of the reducing agent to reduce the metal is decreased by adding a catalyst to the waste, which causes precipitation of the metal into a base of the container.

13. The method of claim 12 wherein the catalyst includes paladium.

14. The method of claim 13, further comprising:

adding a high-acid VMS to the waste, which includes at least one of copper sulfate, sulfuric acid, and hydrogen chloride.

15. The method of claim 1, further comprising:

mixing and agitating the waste in the container.

16. The method of claim 15 wherein the waste is mixed and agitated by at least one of purging a gas therethrough, mechanical mixing and agitation, and recirculation.

17. The method of claim 1, further comprising:

heating the waste in the container.

18. The method of claim 17 wherein the waste is heated to at least 40° C.

19. The method of claim 15, further comprising:
heating the waste in the container.
20. The method of claim 1 wherein the reducing agent is at least one of:
- (i) DMAB;
 - (ii) hypophosphite;
 - (iii) borohydride;
 - (iv) formaldehyde; and
 - (v) glyoxylic acid.
21. The method of claim 1 wherein the metal is at least one of:
- (i) cobalt;
 - (ii) copper; and
 - (iii) nickel.
22. The method of claim 1 wherein the gas is at least one of:
- (i) hydrogen;
 - (ii) carbon monoxide; and
 - (iii) trimethylamine.

23. A method of treating an electroless plating waste, comprising:

- containing the waste in a container;
- adding at least one stabilizing chemical to the waste in the container, the at least one stabilizing chemical being selected to cause release of a gas from the waste at a rate which is higher than without the at least one stabilizing chemical, the gas being contained in an enclosed volume;
- exhausting the gas from the enclosed volume; and
- draining the waste from the container.

24. The method of claim 23, further comprising:

- agitating the waste in the container.

25. The method of claim 23, further comprising:

- heating the waste in the container.

26. A method of treating an electroless plating waste, comprising:

- containing the waste in a container, the waste including a metal and a reducing agent which tends to reduce the waste;
- adding at least one stabilizing chemical to the waste in the container, the at least one stabilizing chemical being selected to (i) decrease the ability of the reducing agent to reduce the metal, and (ii) cause release of a gas from the waste

at a rate which is higher than without the at least one stabilizing chemical, the gas being contained in an enclosed volume above a surface of the waste in the container;

heating the waste in the container by at least 5° C;

agitating the waste in the container;

exhausting the gas from the enclosed volume;

detecting the concentration of the gas in the enclosed volume; and

draining the waste from the container, once the concentration of the gas falls below a predetermined limit.

27. The method of claim 26 wherein the ability for the reducing agent to reduce the metal is decreased by adding a stabilizing chemical to the waste which decreases a pH of the waste.

28. The method of claim 26 wherein the ability for the reducing agent to reduce the metal is decreased by adding a stabilizing chemical to the waste which changes a potential of the reducing agent from anodic toward cathodic.

29. The method of claim 26 wherein the ability of the reducing agent to reduce the metal is decreased by adding a stabilizing chemical to the waste which causes precipitation of the metal into a base of the container.

30. The method of claim 26 wherein the system is at least semi-automatic, depending on at least one of pH, temperature, measured gas concentration, and time.

FIG. 25